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foundly from the series of rocks known in the geological formations. The latter present no analogies to the red clays and oozes, in which, for instance, quartz may be said to be practically absent. The deduction from this is made, that the deeps are of great antiquity. In order to account for such vast accumulations as were there discovered, it is necessary to suppose that these basins have remained the same for a vast period of time.

From the red clays south of the equator, quantities of ear-bones of whales, sharks' teeth, etc., were obtained, which were embedded in nodules of peroxide of manganese, derived from the salts of that metal contained in the seawater. Some products of volcanic eruptions also occurred, and, more interesting than either, certain spherules for which a cosmic origin is confidently claimed. These are mostly extremely small (not more than a millimetre or two in diameter), and may be collected from the dry and powdered ooze by a magnet. These contain sometimes a centre of meteoric iron coated with magnetic oxide, sometimes what seems to be an alloy of cobalt and nickel: others are chondritic, and appear to consist of bronzite or enstatite. All these are characteristically meteoric minerals; and it is indeed remarkable that the investigations of a Nordenskiöld in the arctic snows, should, in their proof of the gain of this planet by the deposit of cosmic material, be upheld and augmented by an investigation of the abysmal ooze of the great deep.

To the narrative are appended, among other documents, a bibliography, sufficiently exact for general purposes, of papers and publications, official and otherwise, to which the voyage has given rise. There is a list of the special reports already printed (more than forty), and of nearly as many more to follow. The concluding part will include an index to the whole, which it is to be hoped will be intrusted to a competent person for preparation. There is a science of indexing, to which we are confident the person who indexed this narrative never served an apprenticeship. Considering the importance, variety, and multitude of facts recorded in these pages, and that there is no systematic arrangement of them in the text, a really thorough, sensible, and scientific index was indispensable. The one which exists, though voluminous enough, is far from meeting the least of these requisites. In this particular, and a few others, we have, as it were, indicated a few spots upon the sun; but we should do much less than justice to the editors, and to the authorities who have sanctioned the

work, were we to omit a distinct enunciation of the opinion that it, and the series it is intended to introduce, as a whole, form the most magnificent contribution to natural science, and monument of enlightened research, which has ever been given to the world in any age or by any country.

THE CHALLENGER REPORT ON THE STALKED CRINOIDS.

THIS magnificent work, which has just been issued by the British government, is beyond question the most important contribution to the literature of the living crinoids since the days of Johannes Müller. When Müller wrote his classical work, 'Ueber den bau des Penta-crinus caput medusae,' in 1841, but a single species of stalked crinoids from the existing seas was known. Carpenter now describes six genera, with thirty-two species, of which two genera and eighteen species were brought to light by the Challenger. In the present report he describes also the remarkable comatulid genus, *Thaumatorcinus*, obtained from a depth of eighteen hundred fathoms, which has underbasals, and interrational plates interposed between the first radials, and a row of anal plates, thus combining, in a measure, the characters of recent and paleozoic crinoids.

The work, though primarily a report upon the crinoidal collections of the Challenger expedition, is, in fact, an almost complete monograph of all recent stalked crinoids known to this time. The descriptive part and illustrations are so excellent and copious as to leave nothing to be desired in this particular.

A large portion of the volume is devoted to comparative discussions of the morphological relations between recent and ancient crinoids, to which he has brought all the resources of a mind equipped with the most varied and accurate knowledge of both living and extinct forms. The importance of this portion of the work in stimulating further researches cannot be overestimated.

In his classification, Carpenter follows Leuckart, and separates the stalked echinoderms from the remainder of the group, under the name 'Pelmatozoa,' which he makes a 'branch' of the 'phylum' Echinodermata, with three 'classes,'—Crinoidea, Cystidea, and Blastoida. The Crinoidea are the strictly brachiate Pelmatozoa, for which Burmeister, in 1856, proposed the name 'Brachiata,' taking rank with

Report on the Crinoidea dredged by H. M. S. Challenger during the years 1873-76. Part I. General morphology, with descriptions of the stalked crinoids. By Dr. P. HERBERT CARPENTER.

the 'Anthodiata,' under which he placed the Cystidea and Blastoidea as sub-groups. The Blastoidea, no doubt, are readily separated from the true Crinoidea; but the two groups are so closely linked together by the Cystidea, that it is extremely difficult to assert whether certain forms are crinoids or cystids, or whether others are cystids or blastoids. For instance: *Caryocrinus* and *Porocrinus* have well-developed free arms, but possess calicine pores; while *Hybocystites*, on the contrary, has cystidean arms and no calicine pores. Similar transitions connect the Blastoidea with the Cystidea; and it is scarcely doubtful that crinoids sometimes have hydrospires. These difficulties do not seem to be wholly met by Carpenter's arrangement, nor indeed, it must be confessed, by any other as yet devised.

Dr. Carpenter's discussion of the relations of the Neocrinoidea to the Palaeocrinoidea should be studied by every paleontologist who aims at something more than mere empirical descriptions. He ranks the two groups as distinct orders, and points out very clearly their structural differences. In the course of these discussions he directs special attention to the oral plates of the Palaeocrinoidea. These plates, he thinks, are represented by the so-called 'proximals,' or ring of plates surrounding the central piece, which he regards as corresponding to the basals in the abactinal system. He calls the central plate the 'oro-central,' and considers it an actinal representative of the 'dorsocentral,' the terminal plate of the column. From one point of view, this theory appears plausible, considering that there is a dorsocentral in ophiuroids and starfishes enclosed within the ring of basals; but it is difficult to understand what function such a plate could have had in the oral system, since it is to be compared with the base of the column in crinoids, while no echinoderm, at any period of life, or in any group, was ever attached by the oral side.

The limits of this notice do not warrant further mention of the details of the book, much less discussions; but the work challenges admiration in almost every requisite of a scientific treatise. Dr. Carpenter's style is clear, vigorous, and incisive. Those who venture to cross swords with him in scientific disputation will do well to carefully measure their strength; for they will find a most formidable antagonist, fully armed at all points, vigilant to discover, and quick to strike at the weak points of an argument. With all this, it is a pleasure to observe the eminent candor and fairness of his treatment of controverted questions. Those who

dispute with him are not allowed to forget that the ultimate aim of all such discussion is not a victory of words, but the discovery of the truth.

NOTES AND NEWS.

THE Chesapeake zoological laboratory, as the marine station maintained by the Johns Hopkins university is designated, is established for the present summer session at Beaufort, on the coast of North Carolina. Dr. W. K. Brooks, the director, who was prevented last year by ill health from giving as much time as usual to the laboratory, is fortunately quite restored to his usual strength, and is in full activity at his post. Twelve collaborators are with him, — Messrs. Andrews, Bruce, Haldeman, Hemmeter, Herrick, Howell, Jenkins, McMurrich, Mills, Morrell, Nachtrieb, and Shimek. Several of these are already teachers in various branches of zoological science, and all of them are well prepared to make use of the opportunities which are afforded at this station. An unusual number are engaged in original researches. On account of the limited accommodations, the director was unable to receive three other persons who applied for admission. The season of 1885, although uncomfortably hot, has thus far been exceptionally favorable for collection. The weather has been calmer than heretofore in June and July, and specimens were found in June which have usually not appeared until the middle of August. The company, notwithstanding their personal discomfort from the heat, have maintained their full enthusiasm in the work upon which they are engaged; and it now appears as if the eighth session of the laboratory would be more fruitful in results than its predecessors, good as they have been. It is too early to speak of the investigations which are in progress, but reports will be made upon them in one of the Johns Hopkins university circulars to be published in the early autumn.

— A cable message to Harvard college observatory, from Dr. Krueger, at Kiel, announces the discovery at Nice of Tuttle's comet (1858) on its expected return. The position received is as follows: August, 9 6124d., *Gr. M. T.*; *R. A.*, 7h. 23m. 43.1s.; *Decl.*, +28° 1' 24".

— Prof. J. E. Hilgard, who has just resigned from his position as superintendent of the U. S. coast-survey, was born in Zweibrücken, Germany, in 1825. His father, a lawyer by profession, emigrated to Illinois in 1835, with a family of nine children, and was a man well known for his writings on social questions. J. E. Hilgard was educated as a civil engineer, and in 1845 entered the coast-survey: he was specially interested in geodetic methods and the tides and terrestrial magnetism. In 1863 he was made a member of the National academy of science, and in 1872 took an active part in the international metric commission in Paris, and was made one of its permanent committee; and it was in that year he